Regulatory and institutional framework in Japan against the background of Fukushima

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On 11 March 2011, Japan endured one of the worst natural disasters in its history when a massive earthquake hit the Pacific coast of the country, followed by a tsunami, which led to a terrible loss of lives. It also led to serious accidents at the Fukushima Daiichi nuclear power units which the Japanese authorities classified at level 7 on the International Nuclear and Radiological Event Scale (INES),[1] indicating the worst possible accident.

This paper summarises the regulatory and institutional framework governing nuclear activities in Japan for a better understanding of both the applicable legislation and the responsible authorities in the field of radiological protection, nuclear safety, emergency management and nuclear third party liability.

The information is based on three authoritative sources that are acknowledged at the beginning so as to limit the number of references throughout the paper:

- OECD Nuclear Energy Agency's "Nuclear Legislation in OECD Countries", Chapter on Japan;[2]
- Japan's report to the 5th review meeting of the contracting parties to the Convention on Nuclear Safety;[3] and
- Report of the Japanese government to the IAEA Ministerial Conference on Nuclear Safety of June 2011.[4]

The accident will trigger a review of international and national approaches to nuclear safety and emergency management as well as the underlying legal and regulatory frameworks but first, it will result in a thorough examination of laws and practices in Japan. Following the accident, the Japanese government established the Nuclear Incident Investigation and Verification Committee which will not only examine technical aspects, but will comprehensively review such factors as human resources, organisations, institutions, as well as the safety culture.[5]

1. INES is a tool for promptly communicating to the public in consistent terms the safety significance of reported nuclear and radiological incidents and accidents. The primary purpose of INES is to facilitate communication and understanding between the technical community, the media and the public on the safety significance of events (INES User's Manual, 2008 Edition, co-sponsored by the IAEA and the OECD/NEA).
2. www.oecd-nea.org/law/legislation/.
3. www.nisa.meti.go.jp/oshirase/2010/files/220831-2-2.pdf.
4. www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html.
5. Speech of Japanese Prime Minister, Naoto Kan, at the Commemoration Ceremony of the 50th Anniversary of the OECD on 25 May 2011 in Paris, France, available at www.kantei.go.jp/foreign/kan/statement/201105/25oecd_e.html.

A. Background – what happened?

On 11 March 2011, at 2:46 pm local time, a magnitude 9.0 Mw on the Richter scale earthquake hit the eastern coast of Japan. The epicentre was at 150 km north-east of the two Fukushima sites, at a depth of approximately 24 km.[6] The Onagawa nuclear site was the closest to the epicentre, at approximately 80 km distance. Eleven reactors, most affected by the earthquake, shut down immediately. From the six units at the Fukushima Daiichi site, three shut down automatically and the other three units were undergoing inspection and were therefore not in operation at the time of the earthquake. At approximately 3:38 pm, a tsunami hit the eastern coast of Japan; the wave which hit the Fukushima site was between 14 and 15 meters in height.

The Fukushima Daiichi site on the Pacific coast of Japan accommodates six boiling water reactors[7] which were designed by General Electric and started commercial operation between 1971 and 1979. Units 1 to 5 have Mark-1 containment design and unit 6 has a Mark-2 containment design. Each unit is designed with several safety structures to protect workers, the public and the environment; these include systems to shut down the reactor quickly, thereby stopping the fission process, systems to cool the fuel in the reactor and carry heat away from it, and finally barriers to contain the radioactivity and prevent it from escaping into the environment.[8]

When reactors are shut down, the heat which continues to be generated within the reactor is no longer from the fission process, but primarily due to the radioactive decay of fission products (decay heat).[9] At Fukushima, cooling was needed to remove this decay heat which is a small fraction of normal operating power. For about one hour following the earthquake and the loss of off-site electrical power, the emergency diesel generators operated and provided electrical power to the systems for decay heat removal. With the loss of the diesel generators, cooling to the fuel in the core was provided by systems that did not require electric power. At unit 1 an isolation condenser system is included in the design for cooling in this situation. However, this system was not available immediately following the loss of electrical power due to damage to equipment caused by the tsunami. At unit 2 the reactor core isolation cooling system was used over the next several days in an attempt to remove decay heat and it was assumed to have shut down at about 1:25 am on 14 March 2011. At unit 3 the reactor core isolation cooling system and the high pressure coolant injection system were used to cool the fuel until about 2:42 am on 13 March 2011.[10]

With the loss of the isolation condenser, reactor core isolation cooling, and the high pressure coolant injection systems, a marathon followed to restore the cooling of the reactors and to ensure the flow of water in order to keep the fuel covered. It was in this context that the decision was made to inject seawater into the reactor vessel. However, even with these efforts significant fuel melting occurred at units 1, 2, and 3.

6. Epicentre: 38°6''N and 142°51''E.
7. Unit 1: BWR-3; units 2, 3, 4, 5: BWR-4; and unit 6: BWR-5.
8. www.nrc.gov.
9. The following technical information is based on Nakoski, J. and Lazo, T., "Fukushima", *NEA News*, June 2011.
10. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety – The Accident at TEPCO's Fukushima Nuclear Power Stations, June 2011, Chapter IV, pp. 50, 65 and 82 (main chronologies for units 1, 2, and 3 found in Tables IV-5-1, IV-5-2 and IV-5-3 respectively).

On 11 April 2011, Japan's Nuclear and Industrial Safety Agency decided to classify the accident and the radiological consequences at 7 on INES.

The technical details of the accident have been presented in detail and in a clear and comprehensive fashion by the Japanese government, international organisations, technical support organisations, regulatory bodies and, one has to acknowledge, even by a large fraction of the general media which is why this article will move on to the institutional and legal framework governing radiological protection, nuclear safety, emergency management and third party liability in Japan.

B. The institutional framework – who's who in Japan?

A brief summary of the institutional framework in Japan in the field of nuclear energy will help understand the steps taken by the various institutions after the accident at the Fukushima Daiichi nuclear power site.

International instruments in the field of nuclear energy almost certainly require the setting up of regulatory bodies.[11] The Convention on Nuclear Safety (CNS) requires, in addition, "an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy", Article 8(2) of the CNS.

The Japanese government acknowledged that the multiplication of organisations and structures hindered the mobilisation of capabilities and the prompt reply to large-scale nuclear accidents;[12] this situation, one might add, would not have been much different in any other country. In the aftermath of Fukushima the proper implementation of the separation principle in Article 8(2) of the CNS was also subject to debate following which the Japanese government announced its decision to make the Nuclear and Industrial Safety Agency (NISA), Japan's nuclear regulator, more independent by separating it from the Ministry of Economy, Trade and Industry (METI), which promotes the use of nuclear energy.[13]

The current allocation of responsibilities in Japan is a result of the Government Re-organisation Basic Law (No. 103 of 12 June 1998) and other laws related to the administrative reform of the central government and following which the Japanese government was re-organised on 1 January 2001.

The most important governmental, administrative, institutional and technical entities shall be described briefly; however, competencies might change as a result of lessons learnt in the aftermath of the Fukushima accident.

Ministry of Economy, Trade and Industry (METI)

METI[14] is in charge of ensuring a stable and efficient energy supply and the uses of nuclear energy. At the same time, it is the ministry in charge of nuclear safety regulations and the licensing of nuclear installations. Within METI, there are specialised structures which carry out METI's responsibilities in this field.

11. For example Article 8 of the Convention on Nuclear Safety; Article 20 of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management; Article 5 of the Convention on the Physical Protection of Nuclear Material.
12. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter XII, p. 12
13. *Ibid.*
14. Established pursuant to Act No. 99 of 16 July 1999.

Agency for Natural Resources and Energy (ANRE)

ANRE's tasks are to ensure a stable and efficient supply of energy, to promote appropriate uses of energy and to ensure industrial safety. The Department of Electricity and Gas Industry within ANRE is in charge of nuclear energy policy, nuclear energy technology development and radioactive waste management. It also oversees the work of the Japan Atomic Energy Agency (JAEA). ANRE's Nuclear Fuel Cycle Industry Division is responsible for ensuring a stable and efficient supply of nuclear materials, technology development for nuclear fuel materials and nuclear facility siting.

The Nuclear and Industrial Safety Agency (NISA)

NISA is the specialised organisation within ANRE, responsible for regulating both nuclear and industrial safety. The drafting of safety regulations and the licensing of milling and refining, nuclear power reactors, nuclear fuel fabrication, reprocessing and storage of spent nuclear fuel, and disposal of radioactive waste are carried out by NISA.

Ministry of Education, Culture, Sports, Science and Technology (MEXT)

MEXT[15] is responsible for the science and technology aspects of nuclear energy, including policy making, development of nuclear technologies, safety regulations governing research reactors, protection against radiation hazards, the use and transportation of nuclear materials except those originating in nuclear fuel cycle facilities and nuclear power plants, the use, storage and transportation of radioisotopes and safeguards. The ministry is also responsible for nuclear third party liability.

Nuclear regulations are administered by the Science and Technology Policy bureau which is divided into six divisions: policy, research and co-ordination, infrastructure policy, nuclear safety, planning and evaluation, and international science and technology affairs.

The Research and Development Bureau consists of seven divisions, including the research and development policy division, which co-ordinates the work of the Bureau and deals with natural disaster prevention technology and nuclear facility siting. The atomic energy division is responsible for nuclear research policy and programmes including their budget. It is also responsible for nuclear third party liability, international co-operation in the field of nuclear energy, peaceful uses of nuclear energy and the development of nuclear fusion science.

Advisory bodies

Atomic Energy Commission (AEC)

The AEC[16] was established with a view to developing policies on all matters related to the research, development and utilisation of atomic energy. Although its functions are advisory, it is a powerful body which can make recommendations, on its own initiative, to the Prime Minister or to other ministries and agencies involved in regulating the use of nuclear energy. These ministries and agencies are also obliged to consult with the AEC when carrying out their own licensing and

15. Established pursuant to Act No. 96 of 16 July 1999.
16. Established under the Atomic Energy Basic Act. The AEC operates under the terms of the Act on the Establishment of the Atomic Energy Commission, Act No. 188 of 19 December 1955.

regulatory activities. AEC can make recommendations on the following matters: policies on the utilisation of atomic energy; co-ordination between different government agencies involved in regulating nuclear activities; the content of regulations dealing with nuclear fuel and nuclear reactors (apart from safety issues); promotion of nuclear energy research; policies on training of professional and technical staff working in the field of nuclear energy.

Nuclear Safety Commission (NSC)

The NSC's[17] functions are to define regulatory policies for the safe uses of nuclear energy; to issue guidelines for the safety of nuclear fuel, source material and nuclear reactors; to issue guidelines on the prevention of ionising radiation hazards resulting from the use of nuclear energy and radioactive fallout; and to make recommendations on any other aspects of radiation safety as it considers appropriate. The Secretariat of the NSC is in the Prime Minister's Cabinet Office. Licensing authorities are obliged to consult the NSC on safety and radiation protection issues in the course of their licensing procedures. The NSC must confirm subsequent regulation performed by the administrative authorities.

Radiation Council

The Radiation Council[18] is a specialised body placed under the authority of MEXT. The principal function of the council is to establish technical standards for radiation protection and measurement of radioactivity levels. The council has a maximum of 20 members, appointed by MEXT.

Japan Atomic Energy Agency (JAEA)

The Japan Atomic Energy Agency[19] is the major national nuclear research and development organisation. The JAEA operates as an independent public institution with a certain degree of autonomous decision-making powers. It has responsibilities, *inter alia*, in the areas of: basic research on nuclear energy; technical feasibility of nuclear fuel cycle activities; contribution to human development in the nuclear field and to improving expertise amongst nuclear scientists and engineers; and collection, categorisation and dissemination of information concerning nuclear energy.

C. The legal framework

General legislation

The starting point of Japan's nuclear legislation is the Atomic Energy Basic Law[20] (the Basic Law). The Basic Law states that its objectives are to ensure energy resources for the future and to promote the research, development and use of nuclear energy for peaceful purposes. Its provisions deal in very broad terms with the mining of nuclear source materials, control over nuclear fuel materials, control over nuclear reactors, protection from radiation hazards and compensation for damage caused by nuclear activities. These provisions, in effect, only express the

17. The Nuclear Safety Commission was established in 1978 in order to separate the functions for nuclear safety from the Atomic Energy Commission which was also responsible for the promotion of nuclear energy, Act on the Establishment of a Nuclear Safety Commission, No. 188 of 19 December 1955.
18. Governed by the Act on the Technical Standards on Radiation Protection, No. 162 of 21 May 1958.
19. 2004 Act on the Japan Atomic Energy Agency.
20. No. 186 of 19 December 1955.

state's intention to exercise regulatory powers in these areas by means of subsequent legislation. The most important of these subsequent acts are:

- Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors[21] (Reactor Regulation Act);
- Act on the Prevention of Radiation Hazards due to Radioisotopes etc.[22] (Radiation Protection Act); and
- Act on Compensation for Nuclear Damage (Compensation Act).[23]

Radiological protection

The accident at Fukushima has resulted in extremely high on-site radiation dose rates, as well as significantly elevated off-site radiation dose rates in the North of Japan.[24] Exposure to radiation can result in human health risks and at very high exposures, sufficient cells are killed to cause whole tissues to cease functioning. The exposure rates reported in the areas off-site in Japan are over a million times lower than the threshold at which serious effects (illness/death) can occur in exposed members of the public. As opposed to these so-called deterministic effects (also called tissue reactions),[25] there are the so-called stochastic effects[26] where radiation exposure at lower levels may increase an individual's risk of contracting malignant disease and heritable effects without a dose threshold. Scientifically it is not possible to distinguish a cancer/leukaemia caused by radiation exposure from one provoked by other causes. However, it is possible to statistically identify, in large exposed populations, whether or not the measured cancer rate is higher than expected. Hence, regarding such stochastic effects, the exposed population in Japan must have its doses assessed and subsequently, if necessary, medical advice should be provided in the long term.

In Japan, activities involving radioactive substances are governed by the Reactor Regulation Act, the Radiation Protection Act and subsequent ordinances. The aim of the Radiation Protection Act is to regulate the use, sale, lease, disposal or any other handling of radioisotopes and ionising radiation-generating equipment in order to prevent ionising radiation hazards and to ensure public safety. In general, any person who wishes to use radioisotopes or ionising radiation-generating equipment must obtain a licence from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The ministry will grant the licence if the proposed site, structure and equipment conform to the standards laid down by ordinance of the Prime Minister,[27] and if potential hazards from ionising radiation have been dealt with satisfactorily (Sections 6, 7 and 7-2 of the Radiation Protection Act). MEXT may attach conditions to the licence and may suspend or cancel it if there is non-compliance with the law or any condition thereof. The use of sealed sources containing radioisotopes below a prescribed quantity is exempt from licensing requirements, but advance notification to MEXT is required. The Radiation

21. No. 166 of 10 June 1957, as amended.
22. No. 167 of 10 June 1957, as amended.
23. No. 147 of 17 June 1961, as amended.
24. The following technical information is based on Nakoski, J. and Lazo, T., *op. cit.*
25. "Deterministic effect: Injury in populations of cells, characterised by a threshold dose and an increase in the severity of the reaction as the dose is increased further. Also termed tissue reaction. In some cases, deterministic effects are modifiable by post-irradiation procedures including biological response modifiers", Glossary of ICRP Publication 103.
26. "Stochastic effects of radiation: Malignant disease and heritable effects for which the probability of an effect occurring, but not its severity, is regarded as a function of dose without threshold", Glossary of ICRP Publication 103.
27. Ordinance No. 56 of 30 September 1960.

Protection Act also contains criminal sanctions (fines and imprisonment) for non-compliance with its provisions.

The regulatory requirements concerning worker protection are specified by the Industrial Safety and Health Act. The act provides that employers take measures to prevent damage to the health of radiation workers, including radiation exposure, throughout the period of employment, and it requires that they be educated on issues of health and safety, work environment monitoring and medical examination of workers. On the basis of the law, the Ministry of Health, Welfare and Labour has enacted the Ministerial Ordinance for Prevention of Hazards from Ionising Radiation which prescribes the requirements for controlled areas, dose limits and measurement, protection from external radiation, and prevention of radioactive contamination. Radiation doses of workers are unitarily controlled at the Radiation Worker's Registration Centre.

A worker is any "person who is employed, whether full time, part time or temporarily, by an employer, and who has recognised rights and duties in relation to occupational radiological protection".[28] In 2009, the total number of radiation workers at commercial nuclear installations in Japan was 83 489.[29]

Japanese legislation sets out dose limits for exposure to ionising radiation. The dose limit is 50 millisieverts (mSv) per year for workers; however the limit for exposure to ionising radiation is 100 mSv for a period of 5 consecutive years; i.e. if a worker has been exposed to radiation of 50 mSv for 2 consecutive years, he/she cannot be exposed to ionising radiation for the following 3 years. The exposure limit for members of the public is at 1 mSv per year. This reflects the relevant 1990 recommendations of the International Commission on Radiological Protection (ICRP, the more recent 2007 recommendations have not changed these limits).[30]

In emergency situations, however, the dose limit for normal working conditions is relaxed for workers. The ICRP in its latest 2007 Recommendations (Publication No. 103) recognises three types of exposure situations:

- Planned exposure situations, which are situations involving the planned introduction and operation of sources.
- Emergency exposure situations, which are unexpected situations such as those that may occur during the operation of a planned situation, or from a malicious act, requiring urgent attention.
- Existing exposure situations, which are exposure situations that already exist when a decision on control has to be taken, such as those caused by natural background radiation.

In emergency situations, the legal dose limit is relaxed for the cases of workers who attempt to save lives or who are working to prevent large collective doses from occurring. Under these extreme and emergency situations, workers are allowed to receive up to 500 mSv. Under Japanese legislation, the dose limit in emergency situations is at 100 mSv per year; however, shortly after the accident at Fukushima, the Japanese government raised the radiation dose limit for emergency response workers at the site from 100 mSv to 250 mSv.[31]

28. Glossary of ICRP Publication 103, 2007.
29. Japan's 2010 CNS Report, *op. cit.*, p. 101.
30. ICRP Publication 103.
31. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter VII-1.

As of 23 May 2011, the official status of radiation doses for the workers engaged in emergency work at the Fukushima Daiichi nuclear power station was that approximately 7 800 people entered the site and were exposed to approximately 7.7 mSv on average.[32] There were 30 people recorded as receiving doses over 100 mSv.[33] On 10 June 2011, NISA reported that two workers have received doses in excess of both the 250 mSv emergency exposure limits established by Japan and the internationally recommended 500 mSv emergency exposure limit.[34]

Nuclear safety

Following the accidents at Three Mile Island in 1979 and Chernobyl in 1986 the national and international nuclear communities undertook concerted efforts to enhance the level of nuclear safety of civilian nuclear power plants. Without doubt, the recent accident at Fukushima, once the situation is stabilised, will bring further insights and subsequent improvements. The question is often less on the statutory side but rather on the implementation and enforcement side. Notably, Japan has a sound legal and regulatory framework for the safe uses of nuclear energy for peaceful purposes which will be briefly presented in this section.

For the construction, etc., of a nuclear reactor in Japan, an applicant must comply with the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors ("Reactor Regulation Act") and the Electricity Business Act.

The purpose of the Reactor Regulation Act is to ensure the safe and peaceful uses of nuclear source material, nuclear fuel and nuclear reactors. It provides for a comprehensive licensing regime governing nuclear activities (refining nuclear source material, manufacture and use of nuclear fuel, construction, operation and decommissioning of reactors, storage and reprocessing of spent nuclear fuel, disposal of radioactive waste, and any other use of internationally safeguarded material).

The Reactor Regulation Act governs the siting, construction and operation of nuclear facilities. Two Cabinet ordinances establish the details of a comprehensive licensing system: the Ordinance implementing the Reactor Regulation Act (Cabinet Order No. 324, 21 November 1957) and the Ordinance for the definition of nuclear fuel material, nuclear source material, reactors and radiation (Cabinet Order No. 325, 21 November 1957). The Radiation Protection Act is also relevant in relation to the safety aspects of nuclear facilities.

Responsibility for the establishment, operation and decommissioning of a nuclear facility depends on the type of facility involved. METI is responsible for reactors used for electricity generation, including those at the research and development stage, and nuclear fuel fabrication facilities, spent fuel storage facilities, spent fuel reprocessing facilities and waste disposal facilities. MEXT is responsible for granting approval for the construction, operation and decommissioning of research reactors, reactors not used for electricity generation, including those at the research and development stage, and for the use of nuclear fuel material for activities not covered by other licences. The Minister of Land, Infrastructure and Transport is responsible for nuclear powered ships.

32. Report of Japanese Government to IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter VII-5.
33. *Ibid.*
34. The doses received were 678 mSv (external exposure 88 mSv, internal exposure 590 mSv) and 643 mSv (external exposure 103 mSv, internal exposure 540 mSv); see NISA press release of 10 June 2011 at www.nisa.meti.go.jp/english/press/2011/06/en20110613-3.pdf.

The Environmental Impact Assessment Act (No. 81, 9 June 1997) establishes a general procedure for the environmental impact assessment of large scale projects which could have a significant impact on the environment, including the construction of a power plant.

The licensing procedure of reactors is divided into three main stages: approval of a particular site, the granting of a construction licence and, finally, approval to operate the installation. A construction licence for a reactor can only be granted if the minister responsible is satisfied that the reactor will be used only for peaceful purposes, the construction is consistent with the national "framework for nuclear energy policy", the applicant has the necessary technical and financial resources, and the location, structure and equipment of the reactor all comply with safety requirements (Reactor Regulation Act, Section 24). Before granting a licence, the minister in charge must seek the views of both the AEC and the NSC on the proposal (Section 24-2). Once the construction licence has been granted, no change is allowed unless approval has been sought and obtained for the change from the minister (Section 26). Before the reactor can begin operation, an inspection must be carried out to the satisfaction of the minister that the construction conforms to the approved design and methods and to all the relevant technical standards (Section 28). The operator must also have an approved set of safety rules and procedures in place before operations may commence (Section 37).

In light of the discussion on safety reviews of nuclear power plants following the accident at Fukushima,[35] it might also be interesting to note that in Japan, the operator is subject to an annual inspection of the facility by the relevant ministry (Section 29). The Reactor Regulation Act was amended in order to strengthen the nuclear safety requirements within nuclear facilities (Law No. 157, 13 December 1999). In this respect, periodic inspections of processing facilities, compulsory notification of their dismantling, and regular checks of the management and operational procedures of nuclear energy facilities are required to ensure compliance with safety regulations. The law furthermore provides for the appointment of inspectors for safety management of nuclear installations under MEXT and METI in order to carry out such inspections.

A licence may be revoked if the operator fails to comply with the obligations pursuant to the Reactor Regulation Act, any applicable orders made under the Reactor Regulation Act or any licence condition (Section 33).

Several regulations made under the Reactor Regulation Act deal in detail with the various categories of reactor. The regulations concerning the installation, operation, etc., of commercial nuclear power reactors (MITI Ordinance No. 77, 28 December 1978, as amended) cover application procedures for commercial reactor design, construction and alteration of facilities, limits on access to controlled areas, storage of nuclear materials and waste and security measures.

The Reactor Regulation Act also contains penalties for various activities subject to the act (Chapter VIII). It should be noted that Section 6 of the Act on Compensation for Nuclear Damage (No. 147, 17 June 1961) prohibits the operation of a nuclear installation if the financial security for damage required by the law is not in place in respect of that installation.

35. For example, the European Commission announced the reassessment of all 143 nuclear power plants in the European Union following which the regulators of the European Union member states agreed to carry out the so-called "stress tests" from 1 June 2011 onwards.

Emergency management

Immediately after the earthquake of 11 March 2011 and the loss of cooling to unit 1 of the Fukushima Daiichi nuclear power plant, Japanese authorities established emergency response structures (see *infra*). The same evening, the Prime Minister of Japan, as the Head of the Nuclear Emergency Response Headquarters, ordered the evacuation of the population within 3 km and the sheltering ("stay-in-house") of the population within 10 km from the Fukushima Daiichi nuclear power plants as a precautionary measure. The next day, such instruction went out regarding the Fukushima Daiini nuclear power plants while with the exacerbation of the situation at Daiichi, the Prime Minister instructed the evacuation of the population within 20 km radius, advising the population within 20 to 30 km to stay at home.[36] The final evacuation zone remained at 20 km from the Daiichi plants while the evacuation zone from the Daiini zone was relaxed. The evacuation affected approximately 78 000 people and the sheltering affected approximately 62 400 residents.[37]

The major difficulty for emergency management activities was the loss of important infrastructures following the earthquake/tsunami, including the communication channels. Therefore, in regard to the following summary of the legal and organisational emergency preparedness and response structures in Japan, the severe situation and challenges in the specific case of Fukushima should be kept in mind.

The Special Act on Emergency Preparedness for Nuclear Disaster (hereinafter referred to as "Nuclear Emergency Act", No. 156 of 17 December 1999) aims to enforce countermeasures in the event of a nuclear emergency. In this respect it modifies and complements the countermeasures against natural disasters (such as floods, earthquakes, tsunamis, eruptions) governed by the Basic Act on Emergency Preparedness (No. 223 of 15 November 1961) which defines the roles of the national government, local governments, etc., in an emergency.

Under the Nuclear Emergency Act, the licensee must take measures to prevent nuclear emergencies, prepare an emergency action plan in consultation with mayors and prefectural governors, and establish a nuclear disaster prevention organisation. This on-site organisation is responsible for taking necessary measures to prevent or mitigate the consequences of nuclear emergencies. The operator shall also appoint a manager for nuclear emergency preparedness who will be responsible for immediately informing the competent ministers, mayors and governors of municipalities and prefectures of a nuclear emergency. The licensee is also required to install and maintain equipment for measuring radiation doses and to provide special radiation protection clothes, emergency communication equipment, etc.

Local governments conduct on-site inspections to check whether or not preventive measures for a nuclear disaster have been taken by licensees in an appropriate manner. They formulate and implement their respective regional disaster prevention plans. Finally, prefectures support the emergency preparedness carried out by municipalities and ensure the overall co-ordination.

Relevant ministers are to establish off-site centres in each prefecture where a nuclear installation is located, which shall take necessary measures in the event of an emergency situation. Off-site centres have necessary facilities and equipment in order to communicate with the Prime Minister's Official Residence, the Cabinet

36. Regarding the sequence of events and measures taken by the Japanese authorities, see Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter V.
37. *Ibid.*

Office, the Emergency Response Centre of NISA, the Emergency Operation Centre of MEXT and related local governments. Each off-site centre is equipped with means to monitor environmental radiation levels and the plant status.

In order to inform nuclear operators about emergency prevention measures and to collect information in the event of an emergency, MEXT and METI appoint specialists in nuclear emergency preparedness in the vicinity of each nuclear installation.

The Nuclear Emergency Act distinguishes two types of nuclear disasters: the specific event and the nuclear emergency. The specific event includes a case in which a radiation dose detected near the site boundary is 5 mSv or more at one point for more than 10 minutes continuously. The nuclear emergency includes a case in which a radiation dose detected near the site boundary is 500 mSv or more at one point for more than 10 minutes continuously and where emergency response measures are taken, such as sheltering or evacuation of residents or the administration of preventive stable iodine.

The Nuclear Emergency Act provides that, in the event of a nuclear emergency, several structures shall be established:

- Within the Cabinet Office, the Nuclear Emergency Response Headquarters shall be established in Tokyo, headed by the Prime Minister.
- The Technical Advisory Organisation in an Emergency, composed of NSC commissioners and the advisors for emergency response, gives technical advice to the Prime Minister.
- The Nuclear Emergency Response Local Headquarters shall be set up at the concerned off-site centre. Local governments shall establish their own emergency response headquarters.
- A Joint Council for Nuclear Emergency Response is to be established at the off-site centre in order to share information between the national government and related organisations such as local governments, licensees, etc., and, if necessary, to co-ordinate emergency measures by the respective organisations.

At the international level, Japan is party to the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Japan participated in several exercises organised at the international level, i.e. the IAEA's Convention Exercise (Convex) and the OECD NEA's International Nuclear Emergency Exercises (INEX). Very regularly national exercises are carried out. Interestingly, on 21 and 22 October 2008, a drill was conducted with the participation of the national government, local governments including the Fukushima Prefecture, TEPCO, and other relevant organisations, assuming an accident at Unit 3 of Fukushima Daiichi nuclear power station in which about 4 000 people, including local residents, participated. In this drill, efforts were made to improve the speed of initial responses, and as part of public relations activities, emergency information was transmitted to the French Embassy in Japan with the co-operation of the embassy.[38]

Third party liability

Soon after the accident, the operator of the Fukushima Daiichi nuclear power plants, Tokyo Electric Power Company (TEPCO), assumed responsibility and liability

38. Japan's 2010 CNS Report, p. 117.

for the nuclear accident. On 28 April 2011, TEPCO established a "dedicated contact line to provide consulting service concerning financial compensation related to the damage caused by the nuclear accident" at Fukushima Daiichi. The homepage of TEPCO provides information to victims (corporations and individuals) on how to claim damages and invites those to submit the so-called "declaration of damage forms".

It remains to be seen how many claims will be filed and how many victims TEPCO will be able to compensate. It will take months and maybe years to fully appreciate the damages which resulted and continue to result from the accident at Fukushima. In the following section, we try to provide answers to questions on the legal framework governing third party liability for nuclear activities in Japan. In particular, the person/entity liable, the extent and nature of that liability, the damages that will be compensable, the availability of funds to cover that liability and the fact that the accident was caused by a grave natural disaster are all both legally and politically important questions.

General principles

Japan has solid national legislation on nuclear third party liability based on the following pieces of legislation and implementing ordinances:[39]

- Civil Code.
- Act on Compensation for Nuclear Damage (Compensation Act).
- Act on Indemnity Agreements for Compensation for Nuclear Damage (Indemnity Act).
- Order for the Execution of the Act on Compensation for Nuclear Damage (Compensation Order).
- Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage (Indemnity Order).

According to this legislative framework:

- The operator of a nuclear power plant is strictly liable.[40]
- The operator is exclusively liable.[41]
- The liability is not limited in amount.
- The operator is obliged to financially secure its liability up to a certain amount (for nuclear power plants JPY 120 billion which equals EUR 1.04 billion or USD 1.49 billion as of 20 June 2011).[42]
- Where nuclear damage exceeds the financial security amount, the government may help a nuclear operator to compensate the damage to the extent authorised by the National Diet.[43]
- Japan's Civil Code (Article 724) provides that all rights of action are fully extinguished 20 years following the date of the tort and that actions be

39. Unofficial translations reproduced in *Nuclear Law Bulletin No. 84* (2009/2), p. 159 *et seq.* (except for the Civil Code).
40. Section 3(1) of the Compensation Act.
41. Sections 3(1), 4(1) of the Compensation Act.
42. Sections 6, 7 of the Compensation Act.
43. Section 16 of the Compensation Act.

brought within 3 years from the date at which the person suffering damage had knowledge both of the damage and of the person liable ("discovery rule").

- Claims may be referred to a special Dispute Reconciliation Committee whose function is to mediate disputes concerning compensation claims.[44]

Purpose of the Compensation Act

The Compensation Act provides a special regime of civil tort law for damages of an exceptional nature. At the same time, it includes public law elements, such as state interventions, penal provisions, etc. Section 1 states that the purpose of the act is to "protect persons suffering from nuclear damage and to contribute to the sound development of the industry by establishing the basic system regarding compensation in case of a damage caused by reactor operation". It clearly reflects the view of the early days of the nuclear industry when nuclear third party liability laws were meant to reach two goals: first the protection of the public from the exceptional risks posed by the production of nuclear energy and secondly the protection of the industry and suppliers from ruinous liability claims.[45]

Nuclear damage

According to the definition in Section 2(2) of the Compensation Act, nuclear damage means "any damage caused by the effects of the fission process of nuclear fuel, or of the radiation from nuclear fuel… however, any damage suffered by the nuclear operator who is liable for such damage… is excluded". This provision corresponds to both the Paris and the Vienna Conventions in that it specifically excludes damages to on-site property, unless it is personal property of any person employed on the site.[46] The purpose of this exclusion is to avoid the financial security being used to compensate damage to the installation itself or other property of the operator to the detriment of third parties. The operator of the Fukushima Daiichi nuclear power plants, TEPCO, must therefore assume the loss or damage to its entire property. Contractors whose property is (was) on the site of a nuclear installation at the time of the accident are equally obliged to assume the loss or damage thereto.

The heads of damage are not defined in the Compensation Act. However, the Dispute Reconciliation Committee for Nuclear Damage Compensation, which the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) may establish following an accident, will mediate reconciliation of any dispute arising from the compensation of nuclear damage, will draft instructions to establish the scale of the nuclear damage and will actually assess nuclear damage (Section 18 of the Compensation Act).

Dispute Reconciliation Committee for Nuclear Damage Compensation

In early April 2011, the Japanese government established such a Dispute Reconciliation Committee which will draft (non-legally binding) guidelines for the compensation of nuclear damage. Despite the official mandate of this committee, it is the Japanese courts that will have the final decision on what qualifies as nuclear damage. However, in the past Japan has been successful in out-of-court settlements thanks to the guidelines of committees and the help of local governments. On 30 September 1999, a critical accident happened in a uranium reprocessing facility of

44. Section 18 of the Compensation Act.
45. Schwartz, Julia, "International Nuclear Third Party Liability Law: The Response to Chernobyl", *International Nuclear Law in the Post-Chernobyl Period*, OECD, 2006, p. 37 *et seq*.
46. Article 3(a) of the PC; Article IV(5)(a) of the VC.

JCO Co. Ltd. at Tokai-mura as a result of which approximately 8 000 claims were raised, most of which were compensated according to the guidelines of compensation in out-of-court settlements.

To date, there is no final list of claims that have been brought to the attention of the committee. It will be a challenge to distinguish the damages that were caused by the earthquake/tsunami from those directly linked to radiation exposure risks. Evacuations were ordered, at first, to protect the population from the inundation and one major difficulty for the committee will be to draw a clear line between victims of the natural disaster and those who have suffered nuclear damage in a stricter sense.

The work of the Dispute Reconciliation Committee is ongoing; however first Guidelines on the Scope of Nuclear Damage were adopted on 28 April 2011 which focus on the damage resulting from instructions issued by the central and local governments (e.g. damages following the evacuation instruction; restriction of marine areas; restriction of shipments of agricultural products and marine products). The committee adopted second guidelines on 31 May 2011 which focus on the method of calculating the damages listed in the first guidelines and which establish additional heads of damages. The committee is currently examining the method of calculating other heads of damage, including those suffered by workers, bankruptcies, costs of decontamination measures, etc.

Exoneration

The operator of a nuclear power plant is strictly and exclusively liable for damage which is caused as a result of the operation of the reactor. However, in light of the massive earthquake and the ensuing tsunami the question of exoneration becomes pertinent and indeed Section 3 of the Compensation Act provides:

> "Where nuclear damage is caused as a result of reactor operation, etc., during such operation, the nuclear operator who is engaged in the reactor operation, etc., on this occasion shall be liable for the damage, *except in the case where the damage is caused by a grave natural disaster of an exceptional character or by an insurrection*".[47]

Given the experience of Japan with natural disasters, the exoneration clause can be seen as a policy decision which relieves the operator and transfers this extraordinary risk and burden to the state collectively. The case, in a way, rationalises the main purpose of the act which is, as mentioned above, "to protect persons suffering from nuclear damage" and "to contribute to the sound development of the nuclear industry". Section 17 of the same act thus states:

> "Where the provision for exoneration in Section 3, paragraph 1 applies… the government shall take the necessary measures to relieve victims and to prevent the damage from spreading."

The above quoted text is an unofficial translation by the OECD's translation service. It has been confirmed, however, that the actual Japanese term corresponds

47. Emphasis added. Note that the 2004 Protocol to amend the Paris Convention does not allow for the exoneration of the operator for nuclear damage caused by a nuclear incident directly due to natural disasters, see Article 9 of the 2004 Protocol (the only grounds for exoneration will be "an act of armed conflict, hostilities, civil war, or insurrection"). Same applies to the 1997 Vienna Protocol [see Article IV(3)]. The Convention on Supplementary Compensation for Nuclear Damage does provide that the "operator shall not be liable for nuclear damage caused by a nuclear incident caused directly due to a grave natural disaster of an exceptional character"; however, the law of the installation state may provide to the contrary, see Annex, Article 3(5)(b), to the CSC.

to the English terms "to relieve" or "to aid" victims which seems to have been chosen purposefully to impose a different obligation on the government compared to the "compensation" obligation imposed upon facility operators.

The government's statements following Fukushima do not suggest that TEPCO will be exonerated from liability due to the "exceptional" character of this natural disaster. TEPCO's statements do equally not suggest that it will invoke the application of this provision in its favour. When the Compensation Act was enacted, the conditions for the exemption on natural disasters were described in the Congress as "huge natural disaster beyond all expectations of humankind".[48] Japan as an earthquake prone archipelago has a rather unique perception of what qualifies as a "grave natural disaster of an exceptional nature". For example, the earthquake in Kobe on 17 January 1995, which registered at 6.9 on the Richter scale and resulted in over 5 000 deaths, did not qualify as a grave natural disaster of an exceptional character.

Courts in civil proceedings will decide if the earthquake of 11 March 2011 qualifies as such a natural disaster beyond all expectations of humankind, but only if TEPCO decides to invoke this exemption against claimants.

Liability and financial security

This section presents the situation in which the exoneration in Sections 3 and 17 do not apply.

Where the operator is liable according to Sections 3 and 4, its only recourse against a third party is where the damage is caused by the wilful act of that third party or where the operator has entered into a special agreement with that third party (such as a supplier) regarding rights of recourse (Section 5).

In the absence of such recourse, the operator's liability is unlimited in amount and its financial security will come into play as a "contract of liability insurance for nuclear damage and an indemnity agreement for compensation of nuclear damage or as a deposit, approved by… MEXT as an arrangement that makes available for compensation of nuclear damage, 120 billion yen… for each installation or site… or as an equivalent arrangement approved by MEXT" (Section 7 of the Compensation Act).

The six units at Fukushima Daiichi are treated as one site, the same applies to the four units at Fukushima Daiini as a result of which for each site the financial security amount is at JPY 120 billion.

A contract for liability insurance is, worldwide, the most common means of financial security. It is interesting that as an alternative to insurance Japanese operators may fulfil their obligation to financially secure their liability by a deposit, Sections 12 *et seq*. of the Compensation Act. The deposit may be made either in cash or in security as provided by MEXT to the legal affairs bureau or the district legal affairs bureau nearest to the main office of the nuclear operator. In case of an accident victims would receive compensation from the cash or the deposited securities.

Should damages exceed the maximum amount of financial security of JPY 120 billion, the operator remains liable (unlimited liability). However, in that event, Section 16 provides that "the government shall give a nuclear operator… such aid as is required for him to compensate the (excess) damage… when the government deems it necessary in order to attain the objectives of this act". Such aid

48. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.

shall be given to the extent that the government is authorised to do so by the National Diet [Section 16(2) of the Compensation Act].

Regarding the Fukushima case, the Japanese government considered the need for such aid and on 13 May 2011 released the "framework for governmental support to Tokyo Electric Power Company (TEPCO) to compensate damage caused by the accident at Fukushima nuclear power station" in which it recognises its "social responsibility… and will provide support to TEPCO under the framework of the Compensation Act, basically aiming to minimise the burden to be placed on the public".[49]

Indemnity agreements

In specifically enumerated cases,[50] so-called "indemnity agreements" for the compensation of nuclear damage constitute an alternative means by which an operator can protect itself against risks for which no coverage is available under standard insurance contracts. These agreements fall under the scope of application of the second statute, the Act on Indemnity Agreements for Compensation for Nuclear Damage. This act provides that where an operator is unable to obtain insurance or other financial security to cover its obligations, the government may indemnify that operator in respect of compensation which it (the operator) has been obliged to pay.[51] Operators in Japan are often unable to obtain insurance or other form of financial security in respect of certain risks, such as earthquakes, volcanic eruptions, and tidal waves. Japanese law distinguishes thus between natural disasters of an exceptional character (with resulting operator exoneration) and those which are below that threshold (and for which operators are obliged to financially secure their liability by indemnity agreements).

The Indemnity Agreements Act stipulates in Section 2 that indemnity agreements will be concluded between the government and the operator "under which the government undertakes to indemnify the nuclear operator for his loss arising from compensating nuclear damage not covered by a liability insurance contract or other means for compensating nuclear damage in case the nuclear operator becomes liable, and under which the nuclear operator undertakes to pay an indemnity fee to the government". Nuclear damage caused by an earthquake or volcanic eruption [Section 3(1)] is subject of such an indemnity agreement. The Order for the Execution of the Indemnity Agreement Act extends its scope of application to "tidal waves" [Section 2 of the order in connection with Section 3(5) of the act]. It does thus not matter whether the damage was caused by the earthquake or strictly speaking by the tsunami since both natural phenomena are risks in respect of which indemnity agreements between the operator and the government apply.

The government's obligation to indemnify the nuclear operator is equivalent to the amount of financial security required by Section 7(1) of the Compensation Act, JPY 120 billion for each installation. Another aspect of the subsidiary nature of indemnity agreements is that wherever the operator has concluded a means of financial security, other than liability insurance contracts, to compensate damages, the amount under the indemnity agreement shall be reduced by the amount available under such other arrangements [Section 7(1) text within brackets]. Also, the time period of the agreements is linked to the reactor operation since according to Section 5 of the act, the period of the indemnity agreement shall run from the time of its conclusion to the time when reactor operation has ceased.

49. www.meti.go.jp/english/earthquake/nuclear/pdf/20110513_nuclear_damages.pdf.
50. See Section 3 of the Indemnity Agreements Act.
51. See Section 10 of the Compensation Act and Section 2 of the Indemnity Agreements Act.

In actual practice, it is the operator which will compensate the victim and, then, in turn, be indemnified therefor by the government. Note that the right to indemnification is extinguished three years after the nuclear operator has paid compensation (see Section 11 of the Indemnity Agreements Act).

Finally, the calculation of fees depends on a formula specified in the act, but depends also on very individual circumstances: the operator pays an annual fee "taking into account the probability of the occurrence of damage covered by the indemnity agreement and the expenditures of the government in relation to the agreement and other conditions concerned".[52] Section 6 of the act in connection with Section 3 of the corresponding order stipulates that the rate shall be 0.03% of the indemnity agreement amount. In order to cover the risk of JPY 120 billion, the annual fee would amount to JPY 36 million; however, the calculation does not take into account individual circumstances, especially the fact that for the maximum amount of coverage the fees should be declining.

Transboundary nuclear damages

Japan is not a contracting party to any of the international nuclear liability conventions. Should there be claims brought forward from outside Japan, claimants will have to rely on general tort law with the burden to establish fault, etc.

Japanese courts would have jurisdiction regarding claims for damages, but applicable law for such claims would not necessarily be that of Japan. Article 17 of the Japanese Act on General Rule for Application of Laws[53] provides that "claims arising from a tort shall be governed by the law of the place where the results of the infringing act are produced. However, if it was not foreseeable under normal circumstances that the results would be produced at that place, the law of the place where the infringing act occurred shall apply". Therefore, Japanese law would apply only if the damage claimed is judged as not foreseeable.[54]

If such foreign damage is claimed in a foreign court, the claimant has to obtain an execution judgment ("judgment on judgment") in Japanese courts for the enforcement in Japan (Article 22 and Article 24 of the Civil Execution Act[55]). In the trial for an execution judgment, the court would not examine whether the foreign judicial decision is justified or not, but the claimant would have to prove that the foreign judgment is final and binding and that all requirements provided by Article 118 of the Code of Civil Procedure, are met.[56]

D. Conclusions

This paper summarised the current institutional and legislative framework in Japan, aware of the fact that following the severe accident at Fukushima Daiichi, it is essential to carefully re-examine the system and adopt the necessary reforms.

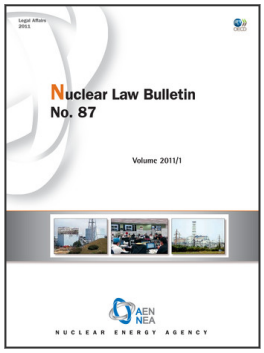
Japan will need time to tackle the challenges ahead and moving in that direction it has made frank statements in terms of weaknesses which it will have to remedy. For example, the Japanese government has announced that it will separate the regulatory body, the Nuclear and Industrial Safety Agency, from the Ministry of Economy, Trade and Industry which is also in charge of ensuring a stable and

52. Section 6 of the Indemnity Agreements Act.
53. Act No. 78 of 2006.
54. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.
55. Act No. 4 of 1979.
56. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.

efficient energy supply.[57] This is an unfortunate case, where five review meetings of the Convention on Nuclear Safety that were supposed to put peer pressure on contracting parties regarding the implementation of the convention failed, and it took a severe accident for a country to realise that only a strong regulator which is *de jure* and *de facto* independent from promotional interests is a credible guardian of nuclear safety.

It is certain that Japan will emerge stronger after the earthquake, including its nuclear sector. To this end, it has announced an enhanced post-Fukushima framework for nuclear safety. In this process, it is hoped that Japan will continue and enhance its participation in the international nuclear community so as to help strengthen nuclear safety worldwide.

57. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter XII-12.



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